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ABSTRACT

This unit describes four secondary school activities related to the geography of the Great Lakes. In Activity A students develop map skills as they study the lakes' positions and associated cities; these skills are applied to the St. Lawrence Seaway in Activity B. Activities C and D involve learners in solving perimeter, area, distance, rate, time, and volume problems using the Great Lakes area for examples. The teacher's guide includes a materials list, overview of the unit, objectives, teaching suggestions, evaluation items, and an answer key. The student workbook is also provided. (Author/WB)

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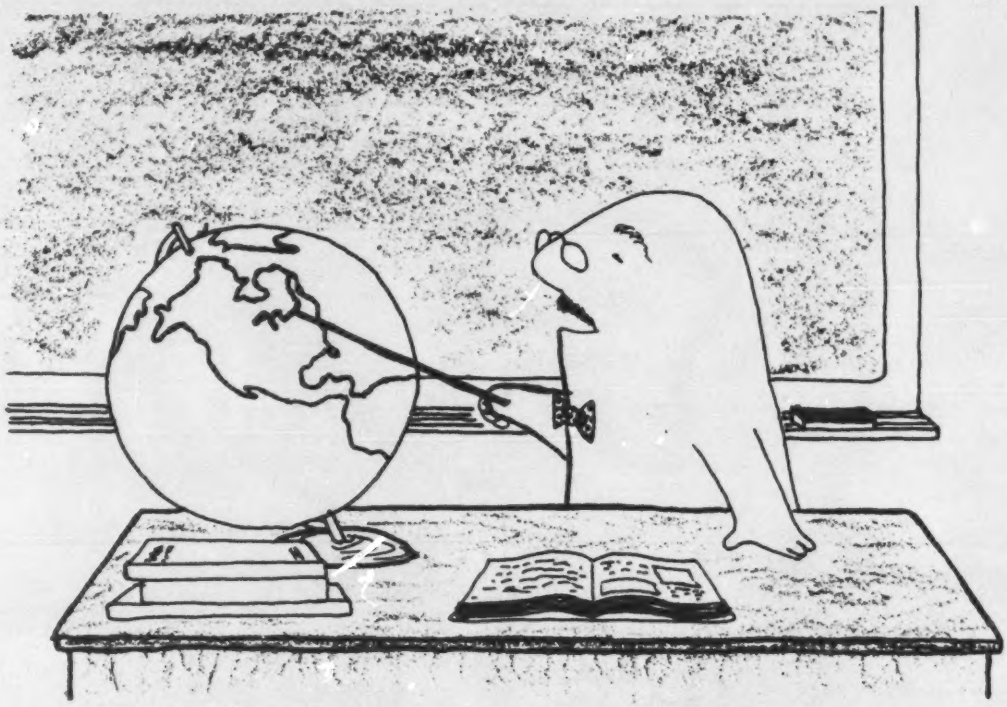
Ohio Sea Grant

**OEAGLS** - Oceanic Education Activities for Great Lakes Schools

# GEOGRAPHY OF THE GREAT LAKES

by

Joyce L. Timmons
and
Rosanne Fortner, The Ohio State University



Ohio Sea Grant Program
Charles E. Herdendorf, Program Director
Victor J. Mayer, Principal Investigator

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OEAGLS Investigation #14
Completed May 1980

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# GEOGRAPHY OF THE GREAT LAKES

INTRODUCTION

Do you know where the Great Lakes are? Have you ever been there? What are the major cities on the Great Lakes? Can you name the lakes? When grade school students were asked questions like these they often said they didn't know the answers. The Great Lakes have played a large part in the development of the Ohio and the Midwest region and continue to be important economically as shipping and recreation centers.

OBJECTIVES

When you have completed this investigation you will be able to:

1. Name the Great Lakes and locate them on a map.
2. Locate the major cities on the shores of the Great Lakes.
3. Tell what waterways ships use to go from the Great Lakes to the ocean.
4. Use basic math skills to determine distance, area, volume and perimeter.
5. Use water displacement as a measure of volume.

ACTIVITY A

WHAT IS THE GEOGRAPHY OF THE GREAT LAKES AREA?

MATERIALS

Classroom map of the United States, metric ruler.

PROCEDURE

The Great Lakes were formed when the glaciers during the Ice Age took away earth and rock from the area as they moved over, creating deep basins. When the glaciers melted, the basins filled with water and the Great Lakes were born.

1. Figure 1 is a map of the Great Lakes area. List the names of the Great Lakes in the lettered spaces that match the letters on the map. Your teacher will provide a map of the United States that you can refer to to find the names.

More than a century ago, the Chippewa Chief Kichwiski paddled a canoe from Duluth to Buffalo, and then walked on to Washington, D.C., to attend a conference on Indian affairs. When the conference was over he walked back to Buffalo and paddled the 1640 km back to Duluth, using the lakes as a natural highway. The settlers of the midwest have also used the Great Lakes as highways for shipments and travel. Large cities have developed along the shores of the lakes. Ohio has two of these major cities along Lake Erie. Toledo is at the western point of Lake Erie, and Cleveland is approximately 155 km east of Toledo.

2. Locate Toledo and Cleveland on Figure 1 and list them below the figure in the spaceshaving the same numbers.

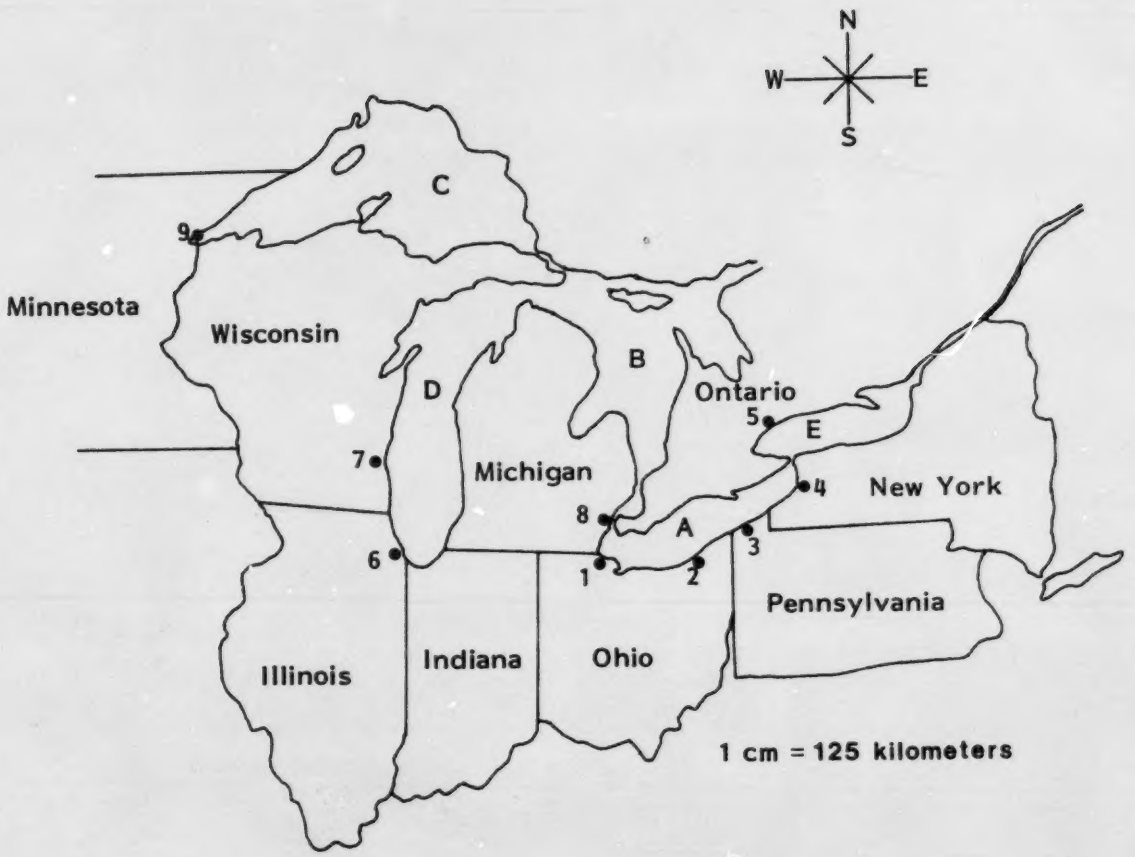



Figure 1: The Great Lakes Area

Great Lakes

a. _____

b. _____

c. _____

d. _____

e. _____

Major Great Lakes Cities

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

3. Pennsylvania has one large port on the shore of Lake Erie. This port is called Erie.

   Find Erie on Figure 1 and list it in the proper space under Great Lakes cities.

4. One hundred fifty-five kilometers northeast of Erie, Pennsylvania, is Buffalo. In what state is Buffalo?

   _____

   Add Buffalo to your list below Figure 1.

There is one large Canadian city on Lake Ontario. It is called Toronto and is in the province of Ontario. Canadian Provinces are similar to states in the United States.

5. Find Toronto on Figure 1 and list it.

Ships pass between Lake Erie and Lake Ontario by way of the Welland Canal. Water moves from one lake to another through the canal and also through the Niagara River. Niagara Falls is located on this river.

Three hundred ninety kilometers due west of Toledo is the second largest city in the United States, Chicago.

6. In what state is Chicago?

   _____

   On which lake is the port of Chicago?

   _____

   List Chicago below Figure 1.

North of Chicago on the same lake is Milwaukee, Wisconsin. Milwaukee is well known for the beer that it produces.

7. Find Milwaukee on Figure 1 and list it under Great Lakes Cities.

Eighty kilometers north of Toledo is Detroit, Michigan. Detroit is the center of the U.S. auto industry.

8. Detroit is not situated on one of the Great Lakes. It is on the Detroit River, which, along with the St. Clair River and Lake St. Clair, forms a connecting waterway between Lake Huron and Lake Erie.

   List Detroit in the proper space below Figure 1.

Passage through Lake Huron can take a ship either into Lake Michigan or Lake Superior. Ships going to Lake Michigan pass through the Straits of Mackinac. Ships move from Lake Huron to Lake Superior by going through the Soo Locks on the St. Mary's River.

At the extreme western tip of Lake Superior is Duluth, Minnesota.

9. Using the map scale in Figure 1, how far is Duluth from Buffalo by air?

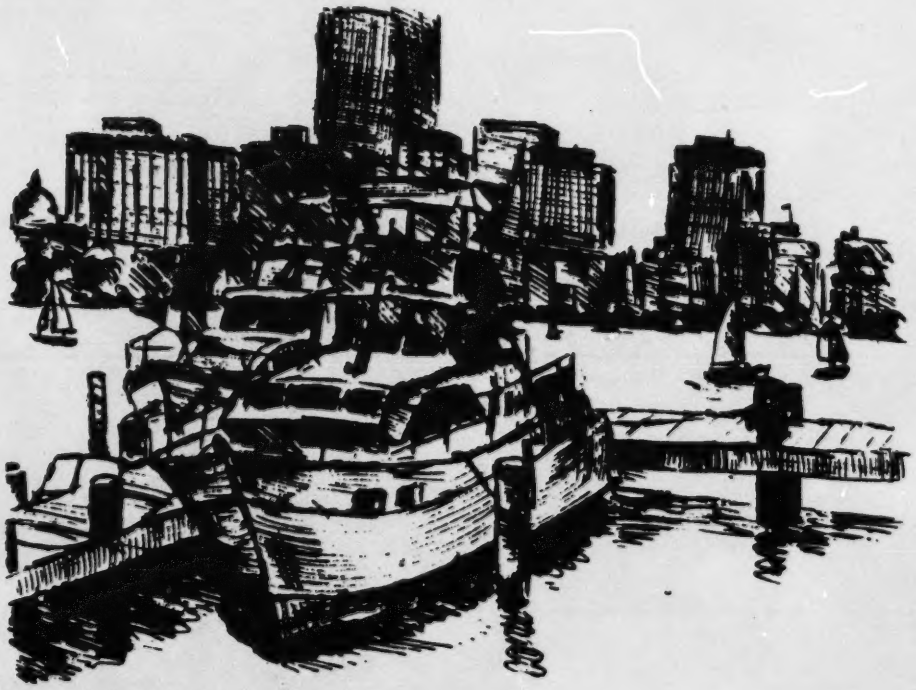
_____

By water?

_____

Label Duluth below Figure 1.

Duluth is near the Mesabi Range where much of our iron ore comes from. It is a major port for shipping iron ore to the steel mills in Indiana and Ohio.



ACTIVITY B

## WHAT IS THE ST. LAWRENCE SEAWAY?

The St. Lawrence River begins at the foot of Lake Ontario and flows generally in a northeasterly direction. The river is at least 3 kilometers wide along its entire length. When it widens to 125 kilometers it becomes the Gulf of St. Lawrence.

MATERIALS

Map of North America, pencil or pen, metric ruler

PROCEDURE

1. Using the large map your teacher provides, find the Canadian provinces through which the St. Lawrence River flows. Label the provinces on the map below. Which province is divided by the river?

_____

Cities on the Seaway

A. _____

B. _____

C. _____

D. _____

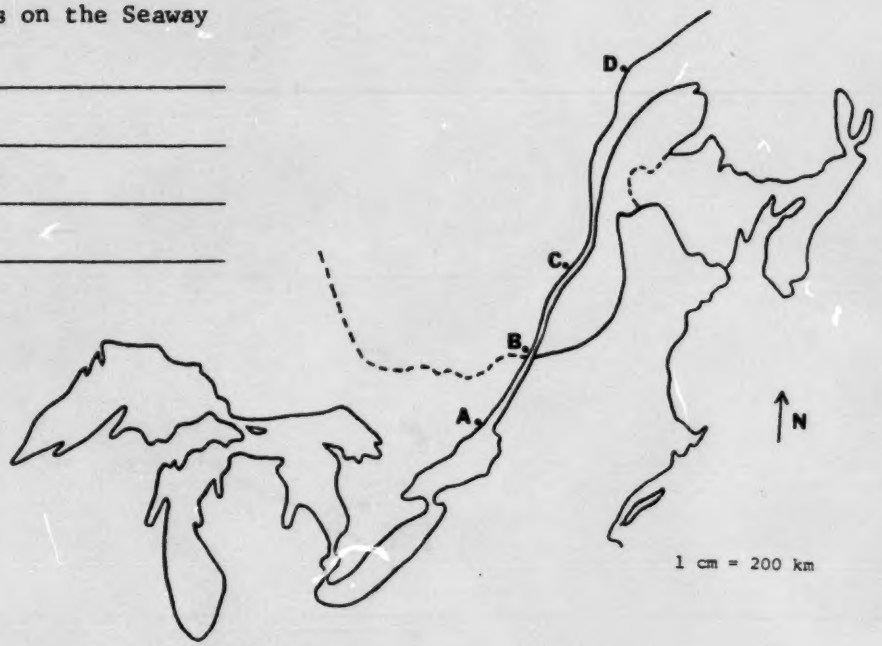



Figure 2. The St. Lawrence Seaway

2. The St. Lawrence River begins at the foot of Lake Ontario opposite the Canadian city of Kingston. Find Kingston on your map and label it next to the proper letter above the map.

   Two-hundred fifty kilometers further north along the river is Montreal. In what province is Montreal?

_____

Montreal is Canada's oldest town and is called the "White City" because of the large amount of light grey limestone used as building material. The St. Lawrence River is navigable for seagoing vessels to Montreal. In order for ships to move on up the river to the Great Lakes, a series of canals and locks have been built. These locks make up the St. Lawrence Seaway.

The city of Quebec is 250 kilometers north of Montreal. Find Quebec on your map and label it in the space given.

Quebec is the capital of the province of Quebec. The name "Quebec" comes from one of Cartier's followers, the French traders who first explored the St. Lawrence. When the follower saw the huge cliff face rising from the water where the city is, he exclaimed, "Que bec!" ("What a beak!" in French) and the name stuck.

The river flows north for another 800 kilometers until it widens into the Gulf of St. Lawrence at Sept-Iles. Find Sept-Iles on your map and label it in the proper space.

3. What is the length of the St. Lawrence Seaway from Kingston to Sept-Iles?

   _____km

4. How far would a ship have to travel to go from Sept-Iles, Quebec, to Duluth, Minnesota?

   _____km

5. Assume that a ship is going from Sept-Iles to Duluth. Fill in below the names of the rivers, lakes and "connectors" you have learned about in Activities A and B. The list is in the order which a ship would follow from east to west.

   Sept-Iles, Quebec

   _____River to Kingston, Ontario

   Lake _____

   _____ Canal

   Lake _____

   _____ River

   Lake _____ at Detroit

   _____ River

   Lake _____

   _____ Locks

   Lake _____

   Duluth, Minnesota

ACTIVITY C

WHAT ARE THE SURFACE DIMENSIONS OF LAKE ERIE?

MATERIALS

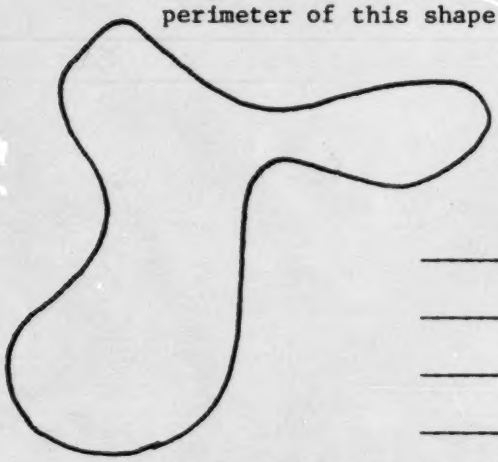
String, metric ruler

PROCEDURE

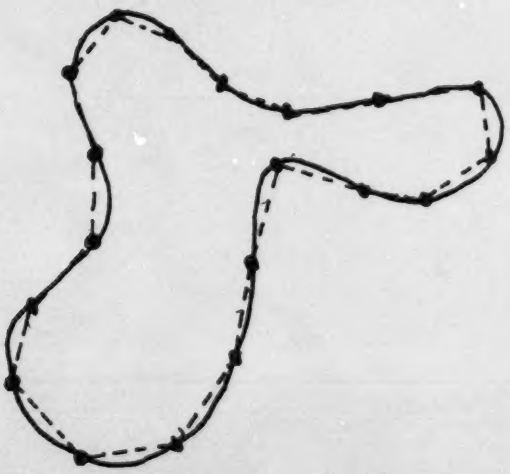
Lake Erie lies along Ohio's northern border. The lake, fourth in size of the Great Lakes, is the eleventh biggest body of fresh water in the world. The word "Erie" is from the Iroquois Indian word "Erige," meaning cat or panther. This was the name of a tribe of Iroquois living on the southern shore of the lake.

PERIMETER

1. Perimeter is the distance around an object. To find the perimeter of a square you would measure all four sides and add the measurements together. To find the perimeter of an irregular shape is more difficult. How would you find the perimeter of this shape?



One way you can approximate the perimeter is to space dots around the irregular object, connect the dots with lines, and then measure each of the segments and find their total length.



Perimeter = 24 cm

2. The more dots you use, the more accurate your measurement will be. Determine the perimeter of Lake Erie in kilometers using this method and the map in Figure 3.

   Perimeter = _____ km

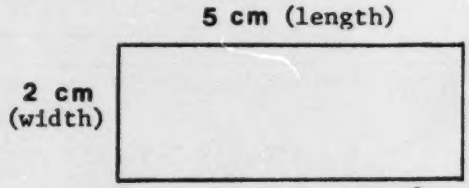
3. A closer approximation of perimeter may be found using a piece of string. The string is laid along the outside of the shape you are measuring, then the amount of string is measured. Use this method to determine the perimeter of Lake Erie in kilometers.

   Perimeter = _____ km

   When geographers measure the perimeter of Lake Erie, they include the perimeter of the islands. The perimeter of Lake Erie including the islands is about 1350 km.

AREA

The area of any regular shape can be found by multiplying the length times the width (L x W = AREA). The figure below has an area of 10 square centimeters.



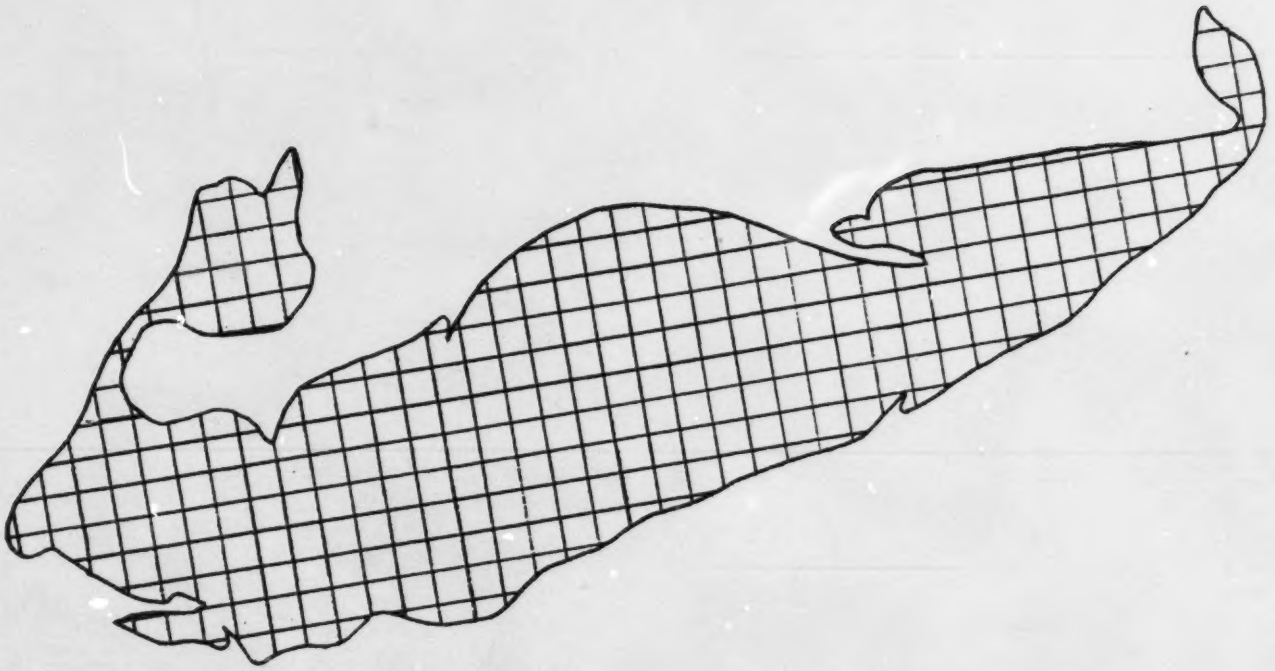

5 cm x 2 cm = 10 $cm^2$

1. This method can be used to form a very rough approximation of the area of Lake Erie. If the approximate length of Lake Erie is 375 kilometers, the width is approximately 89 kilometers, what is the area?

   _____ square kilometers

2. Another way to find area is by using a grid. See Figure 3 on page 10. Each square on the grid of Lake Erie measures one-half centimeter per side. Count the number of one-half centimeter squares that lie completely within the lake.

   Put that number in the chart under I.



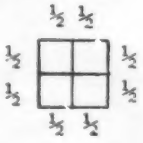
| I | II | III | IV | V | VI |
|---|---|---|---|---|---|
| Number of squares inside Lake Erie | Number of squares around perimeter | Number of squares inside and around the perimeter of the lake (I + II) | Average of I and III $\frac{(I + III)}{2}$ | Area in $cm^2$ (IV ÷ 4) | Area of Lake Erie in $km^2$ ($V \times 20^2$) |
| | | | | | |

Figure 3. Area map of Lake Erie.

Now count the number of partial squares around the perimeter of the lake. Put this number in the chart under II. Add this number to the number of squares that lie completely within the lake. Add I and II together and put the total in III, then find the average of I and III. (Add them and divide by 2.) This gives you an estimate of the area of the small map in square one-half centimeters. Put the average in the chart under IV.

To convert the area from square one-half centimeters to square kilometers, divide the number in IV by 4. This will give you the area in square centimeters.

Four squares ½ cm on a side have an area of one square centimeter (1 $cm^2$).




Put the area in $cm^2$ in the table under V. A square is a shape that has four equal sides. If you know the length of one side of a square, you can find the area by multiplying the side by itself. This is called "squaring." For example, if one side of a square has a length of 3 centimeters, its area would be 9 $cm^2$.

3. On our map one centimeter is equal to about 20 kilometers. What area does one square centimeter represent?

---

Multiply this number by the number of square centimeters in column V. This is the approximate area of Lake Erie in square miles. Put this value in column VI in the table.

The actual surface area of Lake Erie is about 25,370 $km^2$.

APPLYING WHAT YOU KNOW:

DISTANCE, RATE AND TIME PROBLEMS

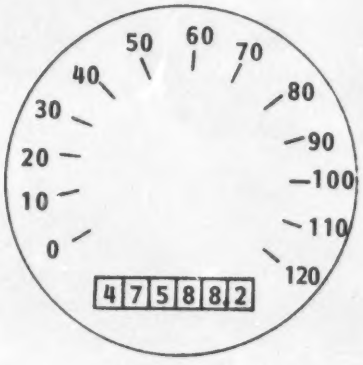
The Great Lakes are used to ship heavy bulky products such as iron ore. They are well suited for this purpose because they are deep enough that very large ships can be used. Is travel by waterway the fastest way for people to travel?

Problems that deal with distance, time needed to go from place to place, and speed are called "distance, rate, and time" problems. There is a formula that can be used to compute these values.

$$\text{RATE} = \frac{\text{DISTANCE}}{\text{TIME}} \left(R = \frac{D}{T}\right) \qquad \text{TIME} = \frac{\text{DISTANCE}}{\text{RATE}} \left(T = \frac{D}{R}\right)$$

DISTANCE = RATE x TIME (D = RT)

An odometer indicates how far a vehicle has traveled. This odometer reads, "forty seven thousand, five hundred eighty-eight point two kilometers," or forty seven thousand, five hundred eighty-eight and two tenths kilometers. It is written: 47,588.2 or 47,588 2/10.




You can determine how far you have gone by subtracting your odometer reading at the beginning of your journey from the reading at the end of the journey. If when you start out your odometer reads 12,583.1 and when you reach your destination it reads 12,621.8, you have traveled 38.7 kilometers.

$$\begin{array}{r} 12{,}621.8 \\ -12{,}583.1 \\ \hline 38.7 \text{ kilometers} \end{array}$$

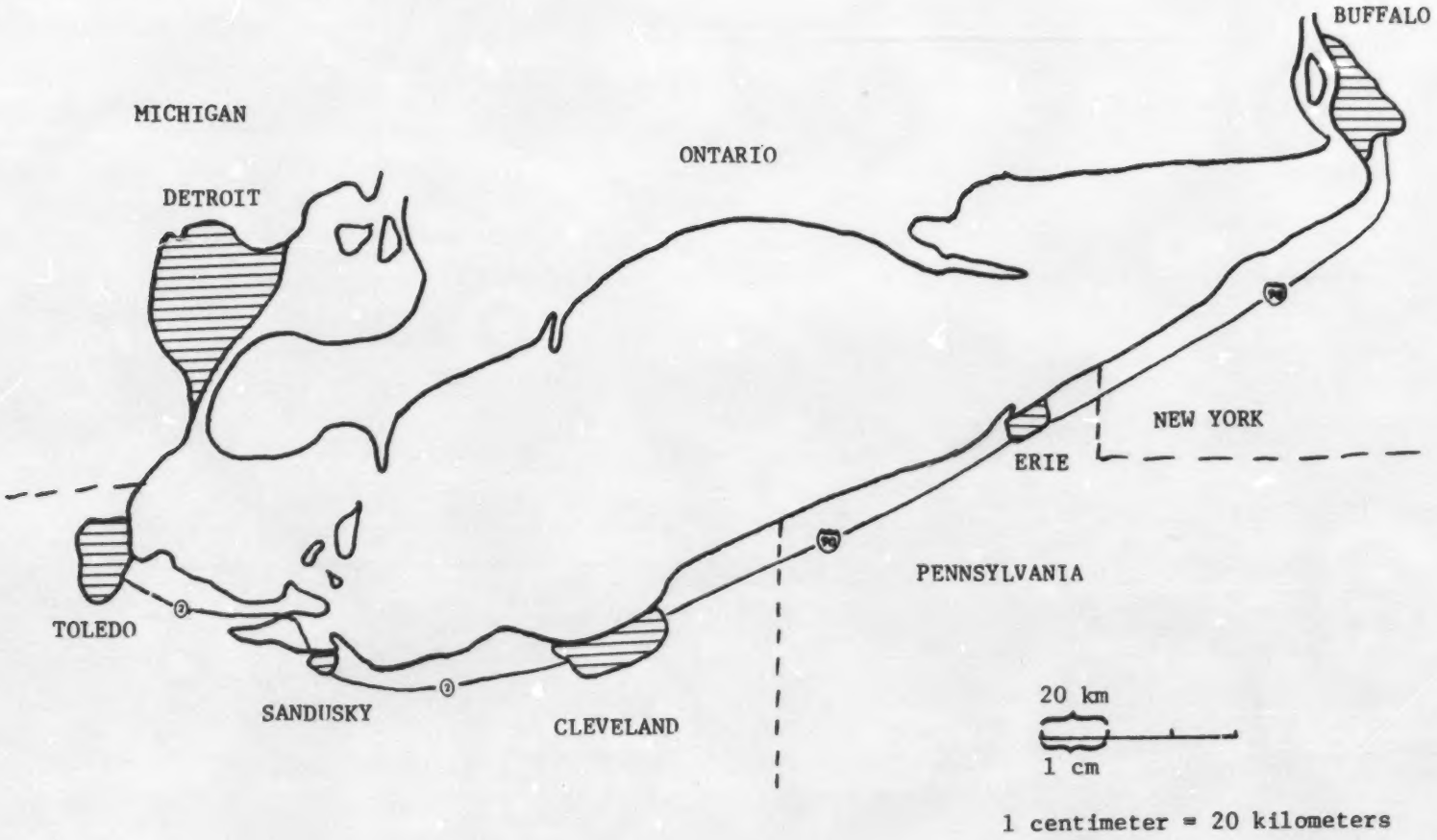



Figure 4. The Lake Erie Region

1. A ship sets sail for Buffalo from Toledo going 40km/hr. The ship reaches Buffalo 10 hours later. How far is it from Toledo to Buffalo by water? (Show your work.)

_____km

2. At the same time a man on a motor bike leaves Toledo following routes 2 and 90. The odometer on the man's motor bike reads 28,749.1 km when he leaves Toledo and 29,229.1 km when he reaches Buffalo. How far has he traveled? (Show your work.)

_____km

If the man traveled at 40 km/hr, how long did he ride?

_____km

3. If you had a choice of going from Toledo to Buffalo by car traveling at 88 km/hr or a ship traveling at 40 km/hr, which would you choose if:

A). You wanted to get to Buffalo the shortest way?

_____

B). You wanted to get to Buffalo the fastest way?

_____

4. What speed would you have to drive in order to arrive at Buffalo at the same time the ship arrives?

_____ km/hr (Show the formula and calculations here.)

ACTIVITY D

## HOW CAN WE FIND THE VOLUME OF A LAKE OR OTHER CONTAINER?

MATERIALS

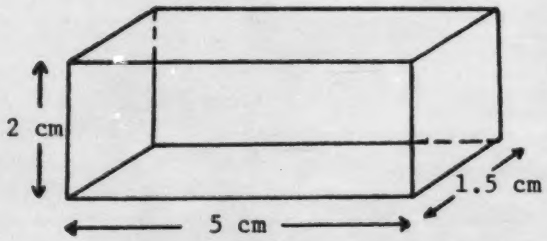
Two plastic containers; an easily measured container such as a small, clean milk carton; a metric ruler; and a graduated cylinder

PROCEDURE

One half of all the fresh water in the world is in the Great Lakes. Lake Erie is the shallowest of the Great Lakes.

Volume is a measure of the amount of liquid, air, etc., a container will hold. To find the volume of a container you multiply the length x width x height. The units used to measure volume are called cubic measurements, such as cubic centimeters ($cm^3$).

1. What is the volume of the container pictured below? (Show your work.)



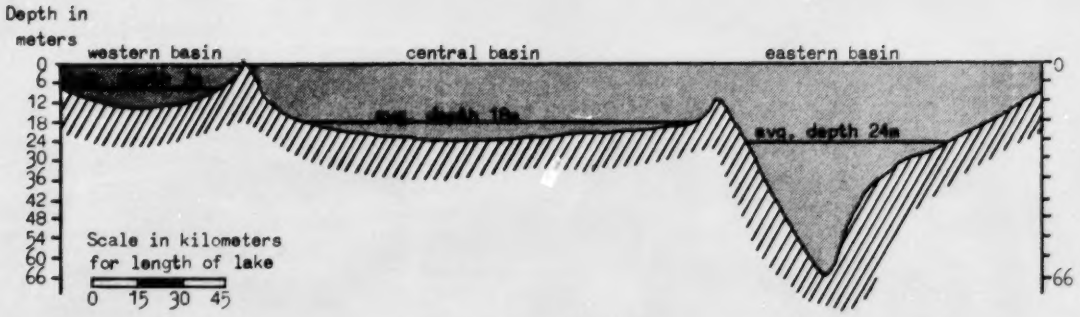

V = L x W x H

V = _____

Geographers measure the surface area of Lake Erie to be 25,370 $km^2$. The depth of the lake varies from east to west and north to south, so it is necessary to average several numbers to find a depth to use for calculating volume.

2. The depths of the parts of Lake Erie are shown on page 15. Add up the average depths for the basins and divide by three to get an average depth for the whole lake. (This gives only a rough estimate, since the three basins are not all the same size and shape.) Show your work.

Average depth = _____ meters




Cross Section of Lake Erie

3. Now that you know the area (L x W) and the depth (H), you can find the volume of the lake.

(Don't forget to convert meters to kilometers! There are 1000 meters in one kilometer.)

Another way to measure volume is by displacement. Displacement is the word used to describe the amount of water that has to move to another place when anything with some weight is added to the water. You can see the effects of displacement when you sit in a bath tub full of water and the water level rises. Your body takes up the space where the water was. Ships are weighed by the amount of water they displace when they float.

4. Set up your apparatus as in Figure 5. The milk carton will represent a ship. The inner plastic container represents Lake Erie and the outer container is to catch overflow.

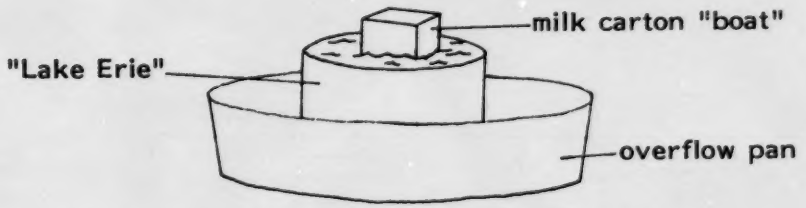



Figure 5. Model of a Ship on Lake Erie

5. Fill the inner plastic container that represents Lake Erie with as much water as it will hold. The water must be all the way up to the top. Float your empty "ship" in the container. Discuss what happens.

_____

_____

_____

6. Fill your ship container with water. Carefully float it in the lake container. You may have to steady it to keep it from tipping over. When water stops spilling from the lake into the overflow basin, remove both the ship and the lake containers from the overflow basin, being careful not to spill any more water. Pour the water from the overflow basin into the graduated cylinder and measure it. How much water was displaced by the ship container?

_____ milliliters (ml)

7. Discard the water in the ship container. Pour the water from the graduated cylinder into the ship container. Is it the same amount of water? _____ Discuss why this happens.

_____

_____

Measure the volume of the ship container by using a centimeter scale. Is the volume in cubic cm the same as the volume in milliliters? _____

In this activity you measured water that spilled out of your model lake. In nature, the lake is so large that the displacement of water by large ships could not be detected.

REVIEW QUESTIONS

1. What are the names of the Great Lakes?

_____

_____

2. What is the name of the lake along the northern border of Ohio?

_____

3. What are the names of five of the large cities along the shores of the Great Lakes?

_____

_____

4. What waterway is used by ships going from the ocean to the Great Lakes?

_____

5. How do you find the area of an object?

_____

6. What other way besides measuring with a ruler is used to determine volume?

_____

_____

7. What is the distance around an object called?

_____

Ohio Sea Grant

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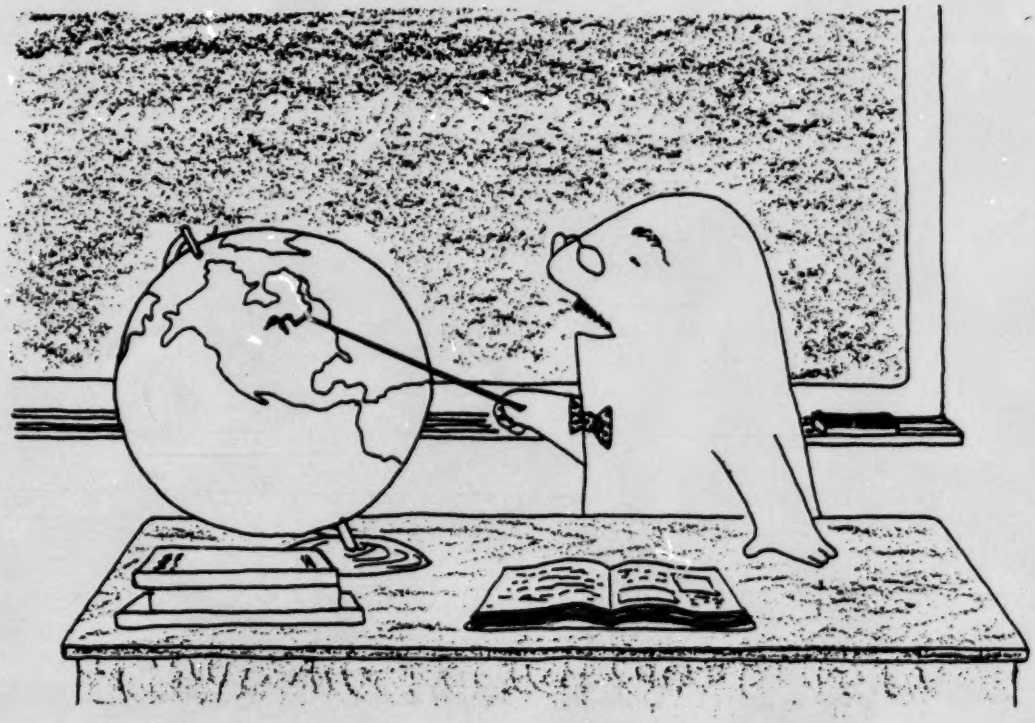

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**TEACHER GUIDE**

OEAGLS INVESTIGATION #14
Completed July, 1980

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**INVESTIGATION** GEOGRAPHY OF THE GREAT LAKES

**OVERVIEW**

In Activity A students study the geography of the Great Lakes area including positions of the lakes and the major cities on the shores of the lakes. This is accomplished by examining a map of the United States and by determining distances and directions on a map to locate cities.

Activity B considers the geography of the entire St. Lawrence Seaway and uses the basic map skills applied in Activity A.

In Activity C students determine perimeter and area of the lake by using basic math skills. Distance, rate and time problems are also introduced.

In Activity D students study volume through a measurement exercise and an activity using water displacement.

**PREREQUISITE STUDENT BACKGROUND**

Students should be able to read maps and perform basic math operations. They should be aware of what is meant by "squaring" a number.

**MATERIALS**

For each student: classroom map of the United States, metric ruler, string, pencils.

For each lab group: two plastic containers of different sizes (lake and overflow); a third container that can be easily measured for volume, such as a small milk carton (See Figure 5 of the Student Guide.); graduated cylinder

**OBJECTIVES**

When students have completed this investigation they should be able to:

1. Name the Great Lakes and locate them on a map.
2. Locate the major cities on the shores of the Great Lakes.
3. Tell what waterway ships use to go from the Great Lakes to the ocean.
4. Use basic math skills to determine distance, area, volume and perimeter.
5. Use water displacement as a measure of volume.

SUGGESTED APPROACH

Activities A, B and C should be done by individual students.

Activity D should be done in groups of three. One student should read the instructions, one operate the equipment and the third observe and report data.

Introduce the investigation by a discussion with your students related to points raised in the Introduction to the Student Guide. Additional information can be obtained from the reference included at the end of this guide. You should also conduct a discussion after the investigation is completed. Be sure that the points included at various places in the Student Guide are understood.

A 17 minute film entitled "The Great Lakes: North America's Inland Seas" (1971) is available from Encyclopedia Britannica Educational Corporation, 425 North Michigan Avenue, Chicago, IL 60611. The film provides an excellent introduction to the Lakes and Seaway, their history, economic importance, climate and general geography. This would be an effective way to begin or end the investigation.

ACTIVITY A

WHAT IS THE GEOGRAPHY OF THE GREAT LAKES AREA?

PROCEDURE

In this activity students learn the position of the Great Lakes, the major cities around the Great Lakes and some of the distances involved in Great Lakes travel.

Map labels for Figure 1 should be as follows:

GREAT LAKES

a. Lake Erie
b. Lake Huron
c. Lake Superior
d. Lake Michigan
e. Lake Ontario

MAJOR GREAT LAKES CITIES

1. Toledo
2. Cleveland
3. Erie
4. Buffalo
5. Toronto
6. Chicago
7. Milwaukee
8. Detroit
9. Duluth

Answers to be filled in other blanks:

4. Buffalo is in the state of New York.

6. Chicago is in Illinois. Its port is on Lake Michigan.

9. From Duluth to Buffalo is 1233 km by air, or about 1600-1640 km by water.

ACTIVITY B

## WHAT IS THE ST. LAWRENCE SEAWAY?

This is an extension of Activity A, designed to show the geographic relationship of the Great Lakes to North America and the Atlantic Ocean.

PROCEDURE

Answers to questions in the Student Guide are as follows:

1. Quebec is divided by the river.

   Labels for Figure 2:

| CITIES ON THE SEAWAY | PROVINCES (labelled on map) |
|---|---|
| A. Kingston | Ontario (west of dash line) |
| B. Montreal | Quebec (east of dash line) |
| C. Quebec | |
| D. Sept-Iles | |

2. Montreal is located in the province of Quebec.

3. From Kingston to Sept-Iles is about 1300 kilometers.

4. From Sept-Iles to Duluth is about 4180 kilometers.

5. Sept-Iles, Quebec

   St. Lawrence River to Kingston, Ontario

   Lake Ontario

   Welland Canal

   Lake Erie

   Detroit River

   Lake St. Clair at Detroit

   St. Clair River

   Lake Huron

   Soo Locks

   Lake Superior

   Duluth, Minnesota

ACTIVITY C

## WHAT ARE THE SURFACE DIMENSIONS OF LAKE ERIE?

The purpose of Activity C is to introduce dimensions such as area and perimeter, to solve distance, rate and time problems and to relate them specifically to Lake Erie.

PROCEDURE

1. Perimeter may be found by dividing the distance around the object into segments and adding up the segment lengths. Or, a string may be placed around the edge of the object and then measured. Some students may know of the map reader's tool that rolls along the paper to calculate distances or perimeters.

2. The perimeter is about 1180 km. This will vary slightly from student to student because of differences in measuring.

3. Perimeter measured this way is about 1400 km. This too will vary.

### AREA

Answers to questions and figures for the student chart are given below:

1. 375 km x 94 km = 33,3375 $km^2$. This figure is a high estimate since the lake is not rectangular.

2. It is suggested that students check off or number the grid squares as they count them. This will avoid missing some squares or counting some twice. Student answers for the chart are likely to vary.

| I | II | III | IV | V | VI |
|---|---|---|---|---|---|
| 210 | 126 | 336 | 273 | 68 | 27,000 |

3. One $cm^2$ = 20 km x 20 km = 400 $km^2$.

### DISTANCE, TIME AND RATE PROBLEMS

1. $D = R \times T$
   = 40 km/hr x 10 hr
   = 400 km

2. 29,229.1
   -28,749.1
   480.0 km

   $T = \frac{D}{R}$

   $= \frac{480 \text{ km}}{40 \text{ km per hour}}$

   = 12 hours

3. A. The shortest route is by ship.
   B. The fastest way is by car.

4. $R = \frac{D}{T}$

   $= \frac{480 \text{ km}}{10 \text{ hrs}}$

   = 48 km per hour

ACTIVITY D

## HOW CAN WE FIND THE VOLUME OF A LAKE OR OTHER CONTAINER?

In Activity D students measure volume in two different ways. First, basic math measurements are used. Displacement is then introduced.

If you set up the apparatus ahead of time, be sure the lake container is <u>completely</u> full.

1. Volume of the rectangular solid:

   $5 \text{ cm} \times 1.5 \text{ cm} \times 2 \text{ cm} = 15 \text{ cm}^3$

2. Average depth of Lake Erie:

   $$\begin{array}{r} 7 \text{ m} \\ 18 \\ +\ 24 \\ \hline 49 \text{ m} \end{array}$$

   $49 \div 3 = 16.3$ meters

3. Volume of Lake Erie:

   Conversion of meters to kilometers.

   $$\frac{16.3 \text{ meters}}{1000 \text{ meters/km}} = \text{about .02 kilometers deep}$$

   $V = L \times W \times H$
   $= 25{,}370 \text{ km}^2 \times .02 \text{ km}$
   $= 507.4 \text{ km}^3$

5. Some (very little) water should spill over. The "ship" may not be heavy enough to displace enough water to break the surface tension.

6. This will vary with the ship container used.

7. The ship should displace the same volume of water that it contained. This is the basis for the definition of displacement.

REVIEW QUESTIONS

1. The Great Lakes are Erie, Huron, Ontario, Superior and Michigan.

2. Lake Erie forms part of the northern border of Ohio.

3. The following are large cities on the Great Lakes: Duluth, Toledo, Detroit, Chicago, Cleveland, Erie, Toronto, Milwaukee, and Buffalo. Students should list any five of them.

4. The St. Lawrence Seaway is used by boats going from the ocean to the Great Lakes.

5. Area = Length x Width. Grids may also be used.

6. The amount of water displaced by an object is equal to its volume.

7. Perimeter is the distance around an object.

REFERENCE

Great Lakes Notebook, Fourth Coast Facts and Issues

This is available from:

Public Information Office
Great Lakes Basin Commission
Post Office Box 999
Ann Arbor, MI 48106

EVALUATION ITEMS

1. How were the Great Lakes made?

   a. Paul Bunyan dug them looking for gold.
   b. Land sank and rain filled the basins.
   c. Earthquakes cracked the earth's surface.
   *d. Glaciers carved basins and ice melted.

2. Which city on the Great Lakes is the center of the U.S. auto industry?

   a. Cleveland
   *b. Detroit
   c. Toledo
   d. Erie

3. Which of the Great Lakes lies entirely within United States boundaries?

   *a. Lake Michigan
   b. Lake Erie
   c. Lake Ontario
   d. Lake Superior

4. Which large Canadian city borders the Great Lakes on Lake Ontario?

   a. Victoria
   b. Duluth
   *c. Toronto
   d. Buffalo

5. Milwaukee is a well-known beer producing city. In which state is Milwaukee located?

   a. Illinois
   *b. Wisconsin
   c. Minnesota
   d. Michigan

6. Which Canadian province is divided by the St. Lawrence River?

   a. New Brunswick
   b. Newfoundland
   *c. Quebec
   d. Ontario

7. Which waterway connects the Great Lakes to the Atlantic Ocean?

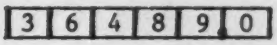
   a. Gulf Stream
   *b. St. Lawrence Seaway
   c. Lake Ontario
   d. Mississippi River

8. What is the perimeter of an object?

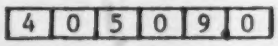
   a. The amount of material an object can hold
   b. Half the distance across it
   c. The distance across it
   *d. The distance around it

You may use a calculator to find the answers to the remaining questions.

A boat traveled from Sept-Iles to Duluth. Odometer readings (in km) at the beginning and end of the trip were as follows:




Odometer reading at Sept-Iles




Odometer reading at Duluth

9. The non-stop trip took 102 hours to complete. The boat's speed was about

   a. 55 km per hour.
   *b. 40 km per hour.
   c. 25 km per hour.
   d. 10 km per hour.

Use the following information to answer questions 10 and 11.

A lake's average length is 300 km.
Its average width is 250 km.
Its average depth is 0.8 km.

10. What is the surface area of this lake?

    a. 93,750 square km
    *b. 75,000 square km
    c. 60,000 square km
    d. 550.8 square km

11. What is the volume of this lake?

    a. 93,750 $km^3$
    b. 75,000 $km^3$
    *c. 60,000 $km^3$
    d. 550.8 $km^3$